AUSTRALIAN LARVAL CARABIDAE OF THE SUBFAMILIES HARPALINAE, LICININAE, ODACANTHINAE AND PENTAGONICINAE (COLEOPTERA)

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Synopsis

Larvae of the following Carabidae are described and figured for the first time: *Cenogmus castelnaui* Csiki (Harpalinae); *Lestignathus cursor* Erichs. and *Dicrochile brevicollis* Chaud. (both Licininae); *Eudalia macleayi* Bates (Odacanthinae); and *Scopodes simplex* Blackb. (Pentagonicinae). The subfamily Pentagonicinae and all five of the genera were previously unknown in the larval state.

This is the second of a projected series of papers (for the first, see Moore (1964)) dealing with Australian carabid larvae, a group about which singularly little information has ever appeared in print. The ultimate aim of the series, namely, the recognition and description of all the principal genera, is likely to prove a long-term project, in view of the size of the fauna and of the difficulties associated with the collection of adequate larval material in an essentially arid environment. However, the piecemeal description of isolated genera, as they become available, serves the very important immediate purpose of adding to our knowledge of world carabid larvae as a whole, and so providing a better perspective for developing the general classification admirably pioneered by van Emden (1942). Thus, on the basis of even the present very limited material, it has been possible to add three subfamilies and nine genera to the tally of those already positively identified in the larval stage. Addition of the few important subfamilies remaining as yet unknown (some of which will undoubtedly fall to the lot of Australian coleopterists) would place the taxonomy of larval Carabidae on a sound basis and allow it to play its full part in the understanding of carabid evolution as a whole.

Subfamily Harpalinae

Cenogmus castelnaui Csiki (*rotundicollis* Cast.)

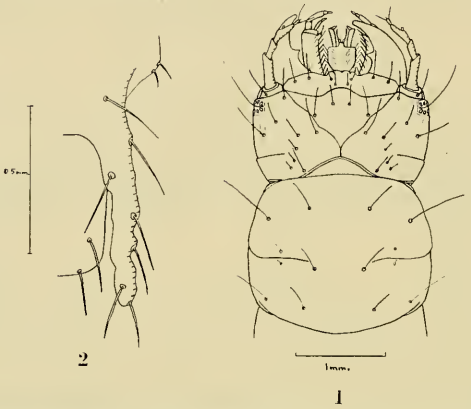
(Figs 1–2)

Mostly pale, whitish; head light brown, the tips of the mandibles darker.

Head rather large, very transverse, moderately sclerotized; frontal piece triangular, almost reaching hind-margin; epicranial suture very short; ventral suture obliterated anteriorly; nasale truncate, not prominent, lightly cuspidate; neck weak but with strong cervical keels; ocelli present, six on each side; postocular furrows feeble; mandible short and stout, with a basal penicillus; retinaculum small; antenna slender, shorter than the mandible, four-segmented; maxilla setose; inner lobe present as a stout tubercle, fused with the stipes, unisetose before apex; maxillary palp three-segmented, the palpiger distinct; labium quadrate, palp two-segmented; ligula small, bisetose, the setae situated on small tubercles. *Pronotum* slightly transverse, lightly sclerotized, slightly broader than head; legs short and stout, with two subequal terminal claws. *Abdomen* with tergites lightly sclerotized, unmargined at sides; pleurites and ventrites membranous; cerci fixed, very short, unsegmented but with setiferous nodes; pygopodium stout, slightly shorter than the cerci.

Length (including cerci): L_2, 10 mm.; L_3, 12–13·5 mm. Head-width: L_2, 1·7 mm.; L_3, 2·0 mm.

Described from one L_2 and three L_3, Koojan, W.A., 16.viii.61 (L. E. Koch), taken from soil, in association with many adults. Although the adults were not reared individually, they appeared in numbers in laboratory trays of Koojan pasture material, where the larvae in question were the only coleopteron previously observed. The identification therefore seems secure.



Figs 1–2. *Cenogmus castelnaui* Csiki, third instar larva (L_3). 1, Fore parts. 2, Right cercus and pygopodium, right side.

In their systematic characters, *Cenogmus* larvae agree well with the general description given by van Emden (1942, p. 39) for larval Harpalini (=Harpalinae in the sense of the present paper) and they appear to come close to the South American genus *Anisotarsus* Chaud. Important characters linking the two genera include the fusion of the inner lobe to the stipes, the small retinaculum and the weakly marked postocular furrows. The main point of difference that can be made out concerns the abdominal praeterga which, in *Anisotarsus*, are defined by a transverse furrow (van Emden, *loc. cit.*), but in *Cenogmus*, are not differentiated from the corresponding terga.

Subfamily Licininae

Lestignathus cursor Erichs.

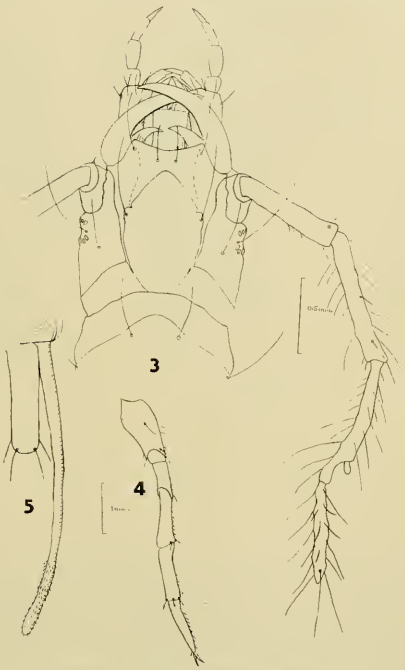
(Figs 3–5)

Very slender larvae, with exceptionally long appendages. Sclerites dark brown; intersegmental membranes and underside mostly pale.

Head small, elongate, strongly sclerotized; frontal piece reaching hind-margin; ventral suture forked anteriorly; nasale emarginate, unarmed; neck weakly marked; cervical keels weak; ocelli present, six on each side; mandible slender, the terebrum finely and irregularly dentate; retinaculum long, falcate; antenna very long and slender, all four segments elongate; vesicle well-marked; maxilla setose; inner lobe a well-marked tubercle, with a stout apical seta; maxillary palp three-segmented; palpiger distinct; labium elongate, the palp stout, two-segmented; ligula minute, bisetose. *Pronotum* elongate, conical, tapering anteriorly to width of head, strongly sclerotized; legs long and slender, with two subequal terminal claws. *Abdomen* with tergites strongly sclerotized, margined anteriorly and laterally; cerci long and slender, smooth, unsegmented and unarmed but pubescent towards apex, not articulating with the ninth segment, but each attached to a separate sclerite; pygopodium slender, tubular, about one-third the length of the cerci.

Length (including cerci): L_3, 20–23 mm. Head-width: L_3, 1·0–1·1 mm.

Described from two L_3, Tasmania: Waratah and Mount Field, 21–26.i.61 (B. P. Moore), taken in wet forest litter. The Waratah specimen occurred in company with numerous adults of *Lestignathus cursor* Erichs. (length, 13–16 mm.) and *L. foveatus* Sl. (length, 7–8 mm.), but only the former species was noted at Mount Field. In view of the size of the larvae and of their obvious licinine affinities, *Lestignathus cursor* and four species of *Dicrochile* (*quadraticollis* Cast., *goryi* Guér., *brevicollis* Chaud. and *minutus* Cast.) would appear to be the only candidate species on the Tasmanian list. However, larval *Dicrochile brevicollis* have since been identified from mainland material (see below) and they prove so distinct from the Tasmanian larvae as to leave no doubt that the latter belong to the large species of *Lestignathus*.



Figs 3–5. *Lestignathus cursor* Erichs., third instar larva (L_3). 3, Head. 4, Right hind leg. 5, Right cercus and pygopodium.

Dicrochile brevicollis Chaud.

(Figs 6–7)

Upperside largely shining black, except head, which is mostly red; ventrites brown, intersegmental membranes pale, whitish.

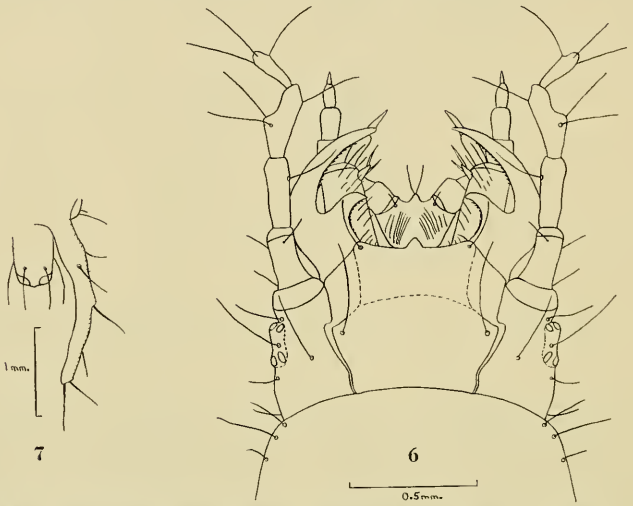
Head small, quadrate, lightly sclerotized; frontal piece reaching hind-margin on a wide front; ventral suture forked anteriorly; nasale a single triangular projection; no obvious neck; no cervical keels; ocelli present, six on each side; mandible strongly curved, denticulate; retinaculum large, falcate, denticulate; basal penicillus present; antenna slender, four-segmented, longer than the mandible; vesicle minute; maxilla setose; inner lobe well marked, with two stout, subapical setae; maxillary palp three-segmented; palpiger distinct; labium trapezoidal; ligula small, bisetose; labial palp stout, two-segmented. *Pronotum* trapezoidal, widest near base, closely adapted to head, strongly sclerotized; legs rather short, strongly spinose, with two subequal terminal claws. *Abdomen* with tergites and pleurites strongly and completely

sclerotized, the tergites margined anteriorly and laterally ; ventrites moderately sclerotized ; cerci short, fixed and unsegmented but with setiferous nodes ; pygopodium short and stout.

Length (including cerci) : L_2, 11–12 mm. Head-width : L_2, 1·0–1·1 mm.

Described from two L_2, East Queanbeyan, N.S.W., 13.i.65 (B. P. Moore), taken from under stones in a dried-up river course, and in company with numerous adult *D. brevicollis*. *Dicrochile* is the only genus of Licininae, with adults of sufficient size, that would be expected to frequent such a habitat.

Larvae of *Lestignathus* and *Dicrochile* differ so widely in general habitus as to suggest that the two genera belong to separate phyletic lines. Such a conclusion is in agreement with the latest arrangement of adult Licininae (Ball,



Figs 6–7. *Dicrochile brevicollis* Chaud., second instar larva (L_2). 6, Head. 7, Right cercus and pygopodium.

1959), where, according to its special mandibular characters, *Dicrochile* is placed in an isolated group. Nevertheless, both genera agree well with the general diagnosis for larval Licininae given by van Emden (1942) and they both show an important subfamily character not mentioned by that author, namely, the pronounced anterior forking of the cranial ventral suture. Jeannel (1942) first drew attention to this distinction from other subfamilies (where the ventral suture is almost always a simple groove) and he looked upon it as involving the formation of a true gula. However, Hinton (1963), who refers to the central segment as the ventral apotome, has shown that it is not homologous with the gula of the adult : the enclosing sutures merely represent lines of weakness associated with ecdysis.

Subfamily Odacanthinae

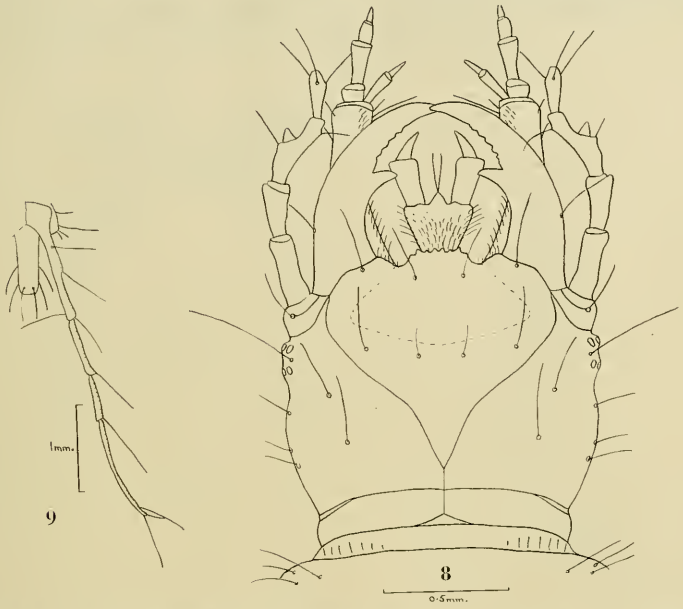
Eudalia macleayi Bates

(Figs 8–9)

Sclerites dark brown ; head light brownish-testaceous ; underside mostly pale, whitish.

Head of average size, quadrate, moderately sclerotized ; frontal piece broadly triangular, not reaching hind-margin ; epicranial suture well marked ; egg-bursters a row of spinules inside the frontal suture on each side ; nasale and adnasalia rather prominent, together forming an irregularly octodentate lobe ; neck strongly marked ; cervical keels present ; ocelli present, six on each side ; mandible rather long, slender, the terebrum serrate ; retinaculum strong,

smooth ; basal penicillus present ; antenna four-segmented, as long as mandible ; vesicle large ; maxilla setose ; inner lobe replaced by a stout seta ; maxillary palp three-segmented ; palpiger large ; labium trapezoidal ; ligula triangular, bisetose ; labial palp slender, two-segmented. *Pronotum* transverse, broader than head ; apex and base of equal width ; sides regularly curved ; legs rather long, spinose, with two subequal terminal claws. *Abdomen* with tergites and pleurites moderately sclerotized, the latter rather prominent ; tergites margined anteriorly but scarcely so at sides ; cerci long and slender, with setiferous nodes, fixed at base but with three articulations ; pygopodium short, tubular.



Figs 8–9. *Eudalia macleayi* Bates, third instar larva (L_3). 8, Head. 9, Right cercus and pygopodium.

Length (including cerci) : L_1, 5·0–5·5 mm. ; L_3, 12–14 mm. Head-width : L_1, 0·47–0·54 mm. ; L_3, 1·2 mm.

Described from two L_1 and eight L_3, Murrumbidgee River, A.C.T., x.60, xi.61 (B. P. Moore), taken amongst gravel at the water's edge, and in company with numerous adults. *Eudalia macleayi* is the only known Odacanthine from this habitat.

The larvae run smoothly to Colliurini (=Odacanthinae), genus *Colliuris* in van Emden's (1942) key and in the absence of material of this northern genus, it is impossible to make out suitable separation characters. However, the evident close agreement in structural characters, between two such geographically isolated genera, serves to support the general system of classification proposed.

Subfamily Pentagonicinae

Scopodes simplex Blackb.

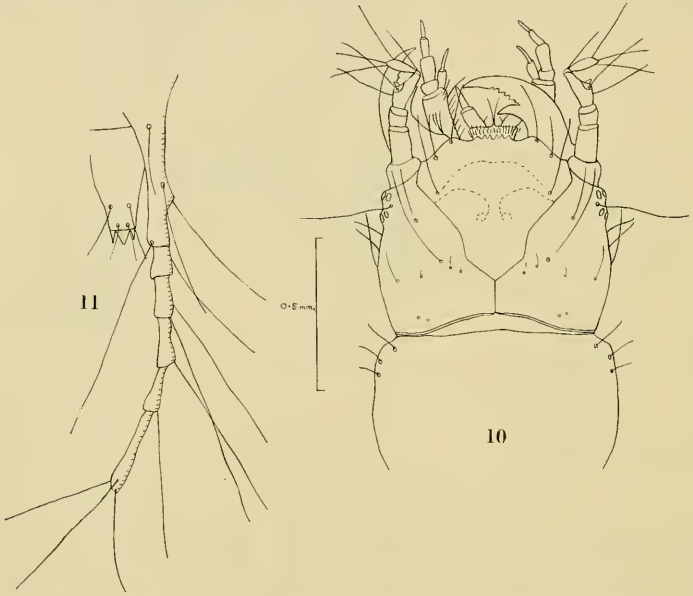
(Figs 10–11)

Upperside mostly dark chestnut-brown ; underside straw-coloured.

Head of average size, quadrate, strongly sclerotized ; frontal piece large, not reaching hind-margin ; epicranial suture distinct ; ventral suture simple ; nasale, with adnasalia, sexdentate ; neck not apparent ; no cervical keels ; ocelli present, six on each side ; mandible rather slender, the terebrum with

fine, rather blunt teeth ; retinaculum strong, smooth ; basal penicillus present ; antenna four-segmented, about as long as mandible ; vesicle well marked ; maxilla weakly setose ; inner lobe replaced by a fine seta ; maxillary palp slender, three-segmented ; palpiger distinct ; labium small, trapezoidal ; labial palp slender, two-segmented ; ligula small, bisetose. *Pronotum* subrectangular, transverse, strongly sclerotized ; legs short, spinose, with two subequal terminal claws. *Abdomen* with tergites strongly sclerotized, unmargined ; cerci slender, moderately long, fixed, but with five articulations and numerous very long setae ; pygopodium short, conical.

Length (including cerci) : L_3, 5·8–6·2 mm. Head-width : L_3, 0·66–0·70 mm.



Figs 10–11. *Scopodes simplex* Blackb., third instar larva (L_3). 10, Fore parts. 11, Right cercus and pygopodium.

Described from eight L_3 and the exuviae from which a pharate adult was bred, Mount Kosciusko (6,000 feet), N.S.W., 26.ii.62, 27.i.65 (B. P. Moore), taken in the open, in company with numerous adults. The bred individual failed to free itself completely from the pupal membranes but its characters are sufficiently developed for positive identification.

This is apparently the first larval Pentagonicine to be recognized and described ; its characters suggest a rather close relationship with the Odacanthinae although, in the adult stage, the two subfamilies are usually placed far apart, largely on account of the state of the anterior coxal cavities (uniperforate in Odacanthinae, biperforate in Pentagonicinae, *teste* Sloane, 1923 ; Jeannel, 1948). However, the value of this character may need to be re-assessed.

According to present data, larvae of the two subfamilies may be separated thus :—

Neck well marked ; cerci with three articulations—Odacanthinae (*Eudalia*, *Odacantha*).
Neck not apparent ; cerci with five articulations—Pentagonicinae (*Scopodes*).

Acknowledgement

The author is grateful to Mr. L. E. Koch, Curator of Insects in the Western Australian Museum, for providing material of *Cenogmus castelnaui*, of the Harpalinae—a subfamily where reliably identified larvae are seldom to be obtained.

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